

Claims

1. A GPS device comprising:

5 a first circuit arranged to receive at least one first signal and arranged to output first timing information dependent on said first signal;

a second circuit arranged to receive at least one second signal and arranged to output second timing information dependent on said second signal; and

10 a third circuit arranged to determine timing information of said device, said third circuit arranged to receive at least one of said first and second timing information, and further arranged to produce a third timing information dependent on at least one of said received first 15 and second signals,

wherein said third circuit is further arranged to produce a location estimate dependent on said first and third timing information; and

20 wherein said third timing information is initially synchronised to said first timing information and maintained substantially synchronised to said at least one first signal using said second timing information.

25 2. A device claimed in claim 1 wherein said first signal comprises a Global Positioning Satellite system signal.

3. A device as claimed in claims 1 or 2, wherein said second signal comprises a cellular network control or communications signal.

30 4. A device as claimed in claims 1 to 3, wherein said first timing information comprises at least one of:

a demodulated Global Positioning Satellite system time;

at least one Global Positioning Satellite system
pseudo-range;

a demodulated Global Positioning Satellite system
timing data word.

5

5. A device as claimed in claims 1 to 4, wherein said
second timing information comprises at least one of:

cellular network base station symbol timing;

cellular network base station frame timing.

10

6. A device as claimed in claims 1 to 5, wherein said
first circuit comprises a Global Positioning Satellite
receiver.

15

7. A device as claimed in claims 1 to 6, wherein said
second circuit comprises a cellular network receiver.

8. A device as claimed in any previous claim, wherein said
third circuit comprises:

20

a GPS demodulator;
a timing estimator;
a location estimator; and
a clock register.

25

9. A device as claimed in claim 6, wherein said first
circuit further comprises:

a GPS demodulator; and
a timing estimator.

30

10. A device as claimed in claim 9, wherein said third
circuit comprises:

a location estimator and a clock register.

11. A device as claimed in any previous claim, wherein said third circuit comprises a cellular reference clock and wherein said third timing information is further maintained substantially synchronised to said at least one first signal
5 using said cellular reference clock.

12. A device as claimed in any previous claim, wherein said second and third circuit is implemented in a single circuit.

10 13. A device as claimed in any previous claim, wherein said device further comprises a threshold circuit arranged to further substantially synchronise said third timing information to said at least one first signal dependent on a threshold event.

15 14. A device as claimed in claim 13, wherein said threshold circuit is arranged to further substantially synchronise said third timing information using said first timing information.

20 15. A device as claimed in claims 13 or 14, wherein said threshold event comprises at least one of:
a time period;
a movement of said device out of a building;
25 a movement of said device following a period of relative static nature;
a determined number of base station handovers;
a received first signal strength threshold;
a number of received first signals.

30 16. An integrated circuit comprising a GPS device as claimed in any previous claim.

17. A device as claimed in claim 8 wherein said clock register comprises random access memory.

18. A method for determining the position of a device using
5 GPS comprising:

receiving at least one first signal;

producing first timing information dependent on said at least one first signal;

receiving at least one second signal;

10 producing second timing information dependent on said at least one second signal;

producing third timing information dependent on said at least one of said first and second timing information;

15 initially synchronising said third timing information to said first signal and maintaining synchronisation to said first signal using said second timing information, and

determining a location of said device dependent on said first timing information and said third timing information,

20 wherein said determining step comprises the step of calculating a difference between said third timing information and said first timing information to determine location estimates.

19. A method as claimed in claim 18, wherein said step of
25 receiving at least one first signal comprises;

receiving at least four GPS signals.

20. A method as claimed in claim 19, wherein said step of
producing at least one first timing information further
30 comprises;

processing said at least four received GPS signals to determine at least four GPS timing signals;

processing said at least four GPS timing signals to produce a true GPS timing signal.

21. A method as claimed in claim 18, wherein said step of 5 receiving at least one second signal comprises;

receiving at least one communications or control signal from a wireless cellular communications system base station.

22. A method as claimed in claims 18 to 21, wherein said 10 step of producing said third timing information comprises a further step of triggering a threshold circuit arranged to further substantially synchronise said third timing information to said at least one first signal dependent on a threshold event.

15

23. A method as claimed in claim 22, wherein said further step of triggering said threshold circuit is arranged to further substantially synchronise said third timing information using said first timing information.

20

24. A method as claimed in claims 22 and 23, wherein said step of triggering said threshold circuit further comprised the detection of a threshold event comprising at least one of:

25

a time period;

a movement of said device out of a building;

a movement of said device following a period of relative static nature;

a determined number of base station handovers;

30

a received first signal strength threshold;

a number of received first signals.